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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/675,095	09/28/2000	Giulio Sandini	IMEC186.001AUS	9116

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EXAMINER	
VILLECCO, JOHN M	

ART UNIT	PAPER NUMBER
2612	

DATE MAILED: 05/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/675,095	SANDINI ET AL.	
	Examiner	Art Unit	
	John M. Villecco	2612	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5 and 11-18* is/are rejected.

7)☒ Claim(s) *1 and 6-10* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 September 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 6.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 1 is objected to because of the following informalities:

- In line 3 of claim 1, applicant recites the phrase "at aleast". This appears to be a typographical error and that the applicant meant to use the phrase – at least –.

Appropriate correction is required.

2. Claims 6-10 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend from any other multiple dependent claims. See MPEP § 608.01(n). Accordingly, the claims have not been further treated on the merits.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kreider et al. (U.S. Patent No. 5,166,511) in view of Pardo et al. ("Space-Variant Nonorthogonal Structure CMOS Image Sensor Design", IEEE Journal of Solid-State Circuits, June 1998).

5. Regarding ***claim 1***, Kreidler discloses an image sensor which consists of a square CCD (7) disposed in the middle of the image sensor and a series of rings including radiation sensitive

elements surrounding the image sensor (7). The CCD (7) inherently has a constant resolution. The rings have a radial change of the density or resolution of the radiation sensitive elements, thereby approximating the construction of the human eye. See column 2, lines 5-26.

Kreidler, however, fails to disclose that the center, or fovea, of the image sensor is comprised of circular arrays of pixels. Pardo, on the other hand, discloses a foveated image sensor which includes a fovea area and a retinal area. The foveal area has 20 rings with a decreasing number of pixels towards the center. Each ring is comprised of a one-dimensional array of equally spaced sensor sites. The retinal area is concentric to the foveal area. Furthermore, as one moves further out on the radius of the image sensor the resolution between the fovea and retina decreases. As disclosed in Kreidler, the purpose of his invention was to replicate the human eye using an image sensor. The arrangement of Pardo clearly improves on Kreidler's invention by eliminating the dead areas around the rectangular CCD. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use concentric rings in the foveal area also, so that the human eye is more precisely replicated.

6. With regard to ***claim 2***, Pardo discloses that the foveal area consists of 20 rings with an increasing number of pixels per ring as one moves radially outward. For instance, the first ring has four pixels, the second ring has eight pixels, the next two rings have 16 pixels, the next five rings have 32 pixels, and the last ten rings have 64 pixels. Therefore, the step increases per ring of pixels always follows the equation n+m, where n is never equal to 1.

7. As for ***claim 3***, Pardo discloses structures similar to applicant's structures as disclosed in Figure 17, which has an aspect within the range of 2.1 to 0.6. Since they have similar structures the aspect ratios would be the same. Additionally, it is well known in the art that most display

arrangements have aspect ratios within the range of 2.1 to 0.6. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have aspect ratios of 2.1 to 0.6 so that it may be displayed appropriately on a display.

8. As for ***claim 4***, the rings are circles.

9. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kreidler et al. (U.S. Patent No. 5,166,511) in view of Pardo et al. ("Space-Variant Nonorthogonal Structure CMOS Image Sensor Design", IEEE Journal of Solid-State Circuits, June 1998, hereinafter referred to as Pardo 1998) and further in view of Pardo et al. ("CMOS Foveated Image Sensor: Signal Scaling and Small Geometry Effects", IEEE Transactions on Electron Devices, October 1997, hereinafter referred to as Pardo 1997).

10. Regarding ***claim 5***, as mentioned above both Kreidler and Pardo 1998 disclose all of the limitations of the parent claim. However, none of the aforementioned references discloses that the integer m is between 3 and 10. While Pardo 1998 does teach that the number of pixels per ring decreases as you approach the center and that the maximum number of pixels in the foveal area is 64, Pardo 1998 discloses that this reduction in pixels is graded based on the ring number. However, Pardo 1997 discloses that the number of pixels per ring is decreased as one approaches the center of the image sensor. Therefore, the reduction of pixels per ring is not graded. Furthermore, as taught by Pardo 1998 the maximum number of pixels per ring is 64. In order to decrease the number of pixels from 64 to 1 in 20 rings, one could reduce the number of pixels per ring by 3. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to reduce the number of pixels per line in a non-graded manner by

decreasing the number of pixels per ring by 3 in order to form a seamless transition between the number of rings per pixel.

11. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pardo et al. ("Space-Variant Nonorthogonal Structure CMOS Image Sensor Design", IEEE Journal of Solid-State Circuits, June 1998) in view of Kreider et al. (U.S. Patent No. 5,166,511).

12. Regarding ***claim 11***, Pardo, discloses a foveated image sensor which includes a fovea area and a retinal area. The foveal area has 20 rings with a decreasing number of pixels towards the center. Each ring is comprised of a one-dimensional array of equally spaced sensor sites. Pardo discloses that the foveal area consists of 20 rings with an increasing number of pixels per ring as one moves radially outward. For instance, the first ring has four pixels, the second ring has eight pixels, the next two rings have 16 pixels, the next five rings have 32 pixels, and the last ten rings have 64 pixels. Therefore, the step increases per ring of pixels always follows the equation n+m, where n is never equal to 1. Additionally, each ring makes a close smooth curve. See the fifth paragraph of page 843.

Pardo, however, fails to specifically disclose that the resolution of the sensor array is constant. Kreidler discloses an image sensor which consists of a square CCD (7) disposed in the middle of the image sensor and a series of rings including radiation sensitive elements surrounding the image sensor (7). The CCD (7) inherently has a constant resolution. Clearly in order to approximate the construction of the human eye, the foveal area of the image sensor would strive to have a substantially constant resolution. Therefore, it would have been obvious

to one of ordinary skill in the art at the time the invention was made to make the foveal area of the Pardo image sensor a constant resolution to approximate the construction of the human eye.

13. As for ***claim 12***, Pardo discloses structures similar to applicant's structures as disclosed in Figure 17, which has an aspect within the range of 2.1 to 0.6. Since they have similar structures the aspect ratios would be the same. Additionally, it is well known in the art that most display arrangements have aspect ratios within the range of 2.1 to 0.6. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have aspect ratios of 2.1 to 0.6 so that it may be displayed appropriately on a display.

14. **Claim s 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pardo et al. ("Space-Variant Nonorthogonal Structure CMOS Image Sensor Design", IEEE Journal of Solid-State Circuits, June 1998, hereinafter referred to as Pardo 1998) in view of Kreider et al. (U.S. Patent No. 5,166,511) and further in view of Pardo et al. ("CMOS Foveated Image Sensor: Signal Scaling and Small Geometry Effects", IEEE Transactions on Electron Devices, October 1997, hereinafter referred to as Pardo 1997)**.

15. As for ***claim 13***, as mentioned above both Kreidler and Pardo 1998 disclose all of the limitations of the parent claim. However, none of the aforementioned references discloses that the integer m is between 3 and 10. While Pardo 1998 does teach that the number of pixels per ring decreases as you approach the center and that the maximum number of pixels in the foveal area is 64, Pardo 1998 discloses that this reduction in pixels is graded based on the ring number. However, Pardo 1997 discloses that the number of pixels per ring is decreased as one approaches the center of the image sensor. Therefore, the reduction of pixels per ring is not graded.

Furthermore, as taught by Pardo 1998 the maximum number of pixels per ring is 64. In order to decrease the number of pixels from 64 to 1 in 20 rings, one could reduce the number of pixels per ring by 3. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to reduce the number of pixels per line in a non-graded manner by decreasing the number of pixels per ring by 3 in order to form a seamless transition between the number of rings per pixel.

16. With regard to ***claim 14***, both Pardo's disclose a retina area surrounding the foveal area, which has a spatially variant resolution.

17. Regarding ***claim 15***, both Pardo's disclose that the spatially variant array has a log polar sensor element location site density.

18. As for ***claim 16 and 17***, both Pardo's disclose that the retinal area consists of 56 rings each having 128 pixels per ring. See paragraph 6 of page 843.

19. With regard to ***claim 18***, both Pardo's disclose an image sensor which is sensitive to radiation.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to:

(703) 872-9306 (For either formal or informal communications intended for entry. For informal or draft communications, please label **"PROPOSED"** or **"DRAFT"**)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington VA, Sixth Floor (Receptionist).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John M. Villecco whose telephone number is (703) 305-1460. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wendy Garber can be reached on (703) 305-4929. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

John M. Villecco
May 4, 2004

WENDY R. GARBER
SUPERVISORY PATENT EXAMINER
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